

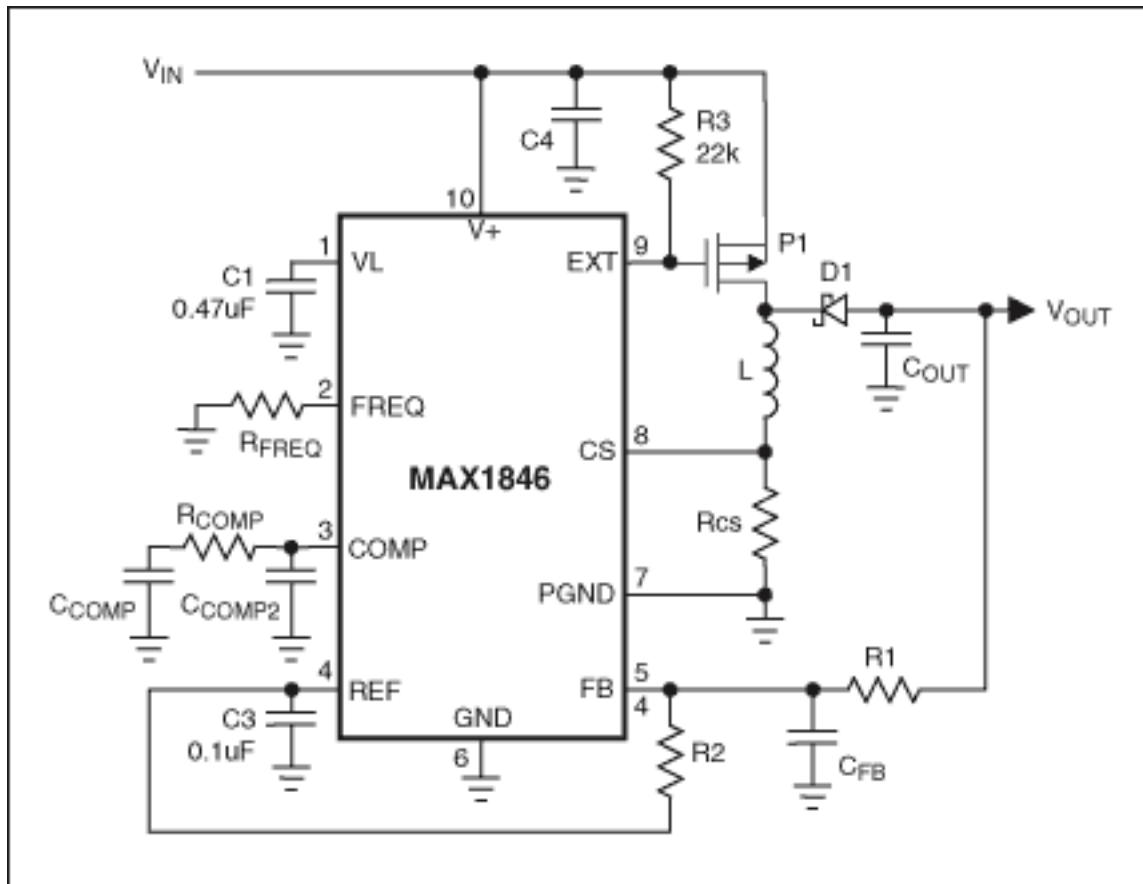
APPLICATION NOTE 3591

Compensation Calculator for the MAX1846/MAX1847 Inverting DC-DC Converters

Abstract: An Excel spreadsheet calculates MAX1846/MAX1847 compensation components based on the application requirements and components' specifications.

The [Compensation Calculator spreadsheet](#) calculates MAX1846/MAX1847 compensation components based on the application requirements and components' specifications. User inputs are entered in column B, highlighted in blue. Calculated values are noted in red.

Inverting Regulator



The Compensation Calculator spreadsheet is easy to use. The list below explains what unit information is required for, or calculated in, each cell. Just enter the required information into column B. The spreadsheet will do the rest.

B2: Chosen R_{FREQ} (frequency setting resistor).

D2: Calculated switching frequency (F_{OSC}).

B3: Enter the maximum input voltage.

B4: Enter the minimum input voltage.

B5: Enter the output voltage, V_{OUT} (must be negative).

B6: Enter the maximum output current.

D6: Calculated equivalent resistive load.

B7: Estimate V_{DS} , of PFET, P1, at maximum peak current (0.1V).

B8: Estimate current-sense voltage (0.1V).

D8: Calculated minimum duty cycle.

B9: Estimate voltage drop across output diode, D1 (0.5V).

D9: Calculated maximum duty cycle.

G9: Calculated RMS input-ripple current, assuming 80% efficiency.

D10: Calculated inductor-ripple current (I_{RIPPLE}), assuming LIR = 0.4 at $V_{IN, max}$.

D11: Calculated inductor, L .

G10: Calculated RMS output-ripple current.

F11: Calculated minimum inductor (for duty cycles greater than 50%).

B12: Enter the inductor (next lower standard value, but greater than L_{MIN}).

D12: Calculated DC current in inductor (I_{LDC}).

D13: Calculated ripple current in the inductor (I_{LPEAK}).

F13: Calculated peak current in the inductor.

H13: Calculated current-sense resistor (R_{CS}).

B14: Bottom feedback resistor, R2.

D14: Calculated top feedback resistor, R1.

B15: Enter the top feedback resistor (next higher standard value).

D15: Calculated COUT for 1% peak-to-peak ripple voltage (Excludes ESR).

B16: Enter the current-sense resistor (next lower standard value).

B17: Enter the output capacitor, COUT (next higher standard value).

D17: Calculated output pole frequency (P_{OUT1}).

B18: Enter the ESR of output capacitor (R_{ESR}).

D19: Calculated DC open-loop gain (A_{DC}).

B20: Enter a compensation frequency (Z_{ESR}) less than F_{OSC} (G20) and F_{ESR} (H20).

D21: Calculated compensation capacitor, C_{FB} .

G22: Calculate right half-plane zero (Z_{RHP}) frequency .

H22: Calculated Nyquist limit (P_{OUT2}).

I22: Calculated output filter cut off frequency (OUT_{FIL}).

B22: Enter the loop crossover frequency (F_{CROSS}) less than Z_{RHP} (G22) and P_{OUT2} (H22).

B23: Enter next lower standard for C_{FB} .

D23: Calculated compensation resistor, R_{COMP} .

B24: Enter the compensation resistor, R_{COMP} (next lower standard value).

D24: Calculated compensation capacitor, C_{COMP} .

B25: Enter compensation capacitor, C_{COMP} (next higher standard value).

D25: Recalculated P_{OUT1} frequency based on compensation components.

D26: Calculated optional roll-off capacitor, C_{COMP2} .

Application Note 3591: www.maxim-ic.com/an3591

More Information

For technical support: www.maxim-ic.com/support

For samples: www.maxim-ic.com/samples

Other questions and comments: www.maxim-ic.com/contact

Automatic Updates

Would you like to be automatically notified when new application notes are published in your areas of interest?
[Sign up for EE-Mail™.](#)

Related Parts

MAX1846: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)

MAX1847: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)

AN3591, AN 3591, APP3591, Appnote3591, Appnote 3591

Copyright © by Maxim Integrated Products

Additional legal notices: www.maxim-ic.com/legal